

RP-5 Renewable Energy Efficiency Project

Quarterly Technical Report

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ABSTRACT

This is the fourth quarterly technical report for the RP-5 Renewable Energy Efficiency Project. The report summarizes the work progress, effort and activities that took place during the period of April 1, 2003 to June 30, 2003. However, IEUA is preparing a Supplemental report that will be mailed to the Department of Energy (DOE) by August 1, 2003, that provides additional information regarding IEUA's plan to expedite certain project activities. The report has been prepared in accordance with the Department of Energy (DOE) Guidelines.

This technical report covers all meetings, discussions, and engineering and design activities that took place to finalize the project scope of work and complete the Request for Proposal (RFP) for the RP-5 Renewable Energy Efficiency Project. IEUA has decided to invite three more consulting engineering firms besides CH2M Hill, the Public Interest Energy Research (PIER) Consultant, to submit proposals for the design of the energy efficiency project. The proposals are currently in the evaluation phase and a decision is expected by the end of July.

IEUA moved to its new headquarters building on June 13, 2003. The central plant is the system that supplies cooling and heating water to the headquarters building, and it primarily consists of equipment listed in the cooperative agreement under "Chiller and Heater." The central plant equipment was successfully installed and started.

Other activities include gas analysis of three sources of low quality digester gas and foul air which could be used as fuel for an innovative flex microturbine. IEUA is also working with Stirling Energy Systems to determine if the Agency should be a host site for their equipment for testing the engine's operation on digester and natural gas.

A matching funds update is also included in the Results and Discussion section, which presents the work effort performed by the PIER Consultant and the associated costs that serve as matching funds for the RP-5 Project during this report period.

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INTRODUCTION

Work on the RP-5 Renewable Energy Efficiency Project continued through this report period. The prime objective is to expedite various project activities with a focus on the completion of the Request for Proposal (RFP), selection of a consultant, and ultimately starting and commencing the preliminary design phase.

There are four major tasks that were addressed during this report period. They are listed below:

- Request for Proposal (RFP);
- Central Plant startup;
- Research: Flex Microturbine and Stirling Engine; and,
- PV System for Agency's headquarters.

Request for Proposal

The draft RFP which was prepared during the research phase of the project was updated and modified to include the latest scope updates and to invite several consultants to propose for the consulting engineering and construction services for the project. The RFP was completed and sent out to four consultants on June 9, 2003. A pre-proposal briefing was held on June 18, 2003, where IEUA met with all participating consultants for open project discussion followed by a site tour. All proposals were submitted by consultants on July 14, 2003. Participating consultants include Parsons Corporation, CH2M Hill, Montgomery Watson Harza and DMJM.

The RFP was based on the Energy Charrette and subsequent conceptual design kickoff workshop during the research and planning phase of the project. Thus, the RFP, besides including the project's outline and scope of work, follows the guidelines and recommendations of the innovative equipment manufacturers and leading experts.

Central Plant Startup

Another significant activity that took place during this report period is the startup of the central plant which supplies the cooling and heating water for the new headquarters building. The central plant includes most of the equipment that is part of the cooperative agreement equipment list as shown in Item C "Chiller and Heater." The central plant includes two boilers, four chillers, rented cooling tower, miscellaneous heat exchangers, pumps, piping and electrical systems. The main purpose of the central plant is to provide air conditioning and heating to the office space in the headquarters building. The central plant equipment was successfully installed, tested and started up. Although initial cooling issues arose, they were addressed and the equipment has been working properly in providing adequate air conditioning over the past month during unusually hot and humid outside temperatures.

Research

IEUA has contracted Environmental Analytical Service (EAS) labs to perform gas analysis on low quality digester gas and foul air at the primary clarifiers at Regional Plant No. 1 (RP-1) and at the manure digester facility at RP-5. The purpose of this analysis is to determine if this digester gas can be utilized for power generation using innovative flex microturbine instead of flaring and wasting the gas. The digester gas is produced by the biosolids acid digester and anaerobic manure digester (AMD) at RP-1, with low heating value (Btu/scf) that cannot be used for the existing IC engines. Foul air could be used as fuel for the flex microturbine if it contains methane with a two percent concentration. Two goals may be achieved by doing this: odor reduction and power generation.

IEUA is also working with Stirling Energy Systems (SES) to determine the best location for using their experimental Stirling engine. IEUA has met with SES and explored two possible locations for the engine and associated testing skid at RP-1 and RP-5. The engine would be the first of its kind to run natural or digester gas according to SES.

Power Voltaic System for Agency's Headquarters

Finally, IEUA is in the process of installing a 60 kW photovoltaic (PV) power generation system on the roof of the new headquarters building. This project is one of the activities of the California Energy Commission (CEC) funded PIER Program.

EXECUTIVE SUMMARY

The RP-5 Renewable Energy Efficiency Project continued its progress towards the selection of a consulting engineer for the project and commencing the preliminary design phase. Activities that took place during this report period are summarized as follows:

- Request for Proposal (RFP) for the RP-5 Renewable Energy Efficiency Project
 - RFP was updated and completed in early June 2003;
 - IEUA extended an invitation to four leading consultants to submit proposals for the design and construction services;
 - A complete RFP along with a copy of the Alternative Energy Analysis Report were sent to participating consultants on June 9, 2003;
 - Participating consultants include Parsons Corporation, CH2M Hill, Montgomery Watson Harza and DMJM;
 - Pre-proposal briefing with participating consultants was held on June 18, 2003 at IEUA's headquarters followed by a site tour;
 - Proposals were due on July 14, 2003; all four invitees submitted a full proposal. Consultant selection is expected by the end of July.
- Central Plant Startup
 - The move took place on June 13, 2003;
 - The new headquarters building was designed and constructed in accordance with the LEED (Leadership Energy and Environmental Design) guidelines and standards; LEED certification is being sought from the United States Green Building Council which issues such certification;
 - The central plant which includes cooling and heating equipment for the headquarters played a key role in LEED qualification. The central plant includes energy efficient systems and renewable fuel usage such as biogas fuel for boilers;
 - Central plant equipment includes the absorption chillers, boilers, heat exchangers, pumps and a state of the art control system which optimizes the plant operation for higher performance and tremendous energy savings; and,
 - Central plant equipment were successfully installed and operated two days prior to the move.
- Flex Microturbine
 - A contract was established with Environmental Analytical Service labs to perform analysis on three digester gas and foul air samples for the purpose of using renewable energy fuels for power generation;
 - A Flex microturbine could run on low quality gas that cannot be used for conventional internal combustion engines. A Flex microturbine

could also run on foul air with two percent methane tracing according to the manufacturers;

- Sample locations included RP-1 primary clarifiers and acid digester and RP-5 dairy manure facility. At RP-1 acid digester, a mixture of manure gas and digester gas are combined and piped to the flare. At RP-5 dairy manure digester facility, the foul air is pulled from the building and sent to the biofilter. Gas and foul air samples were taken by IEUA staff;
- Flex microturbine is scheduled for shop testing some time in July 2003. It will be the first of its kind to run on 15 Btu/scf (2% methane) fuel gas;
- Terms and conditions between IEUA and FlexEnergy regarding using IEUA's facilities as a host site for the flex microturbine are still being discussed; IEUA may consider this project if proven to be cost effective.; and,
- The Flex microturbine project is partially funded by the CEC.

- Stirling Gas Engine

- IEUA is working with Stirling Energy Systems on the possibility of being the host site for their Stirling engine;
- Two possible locations for the engine within IEUA facilities have been identified at RP-1 and RP-5; however, the RP-5 location may be more appropriate as the engine would be in the vicinity of the RP-5 Renewable Energy Efficiency Project;
- The engine will be field tested and run on digester gas, natural gas or a mixture of both;
- The engine will require fuel gas, cooling water and power connections, and an outdoor enclosure to complete the test;
- The Stirling engine running on digester or natural gas will be the first of its kind; all existing Stirling engines run on kerosene according to Stirling Energy Systems.
- The Stirling engine project is partially funded by the California Energy Commission (CEC) under the PIER II Program.

- PV for the IEUA Headquarters Building

- IEUA is currently in the process of installing a 60 kW photovoltaic (PV) system on the roof of the Headquarters Building.
- There are 2-20 kW PV panels and 10-2 kW panels being installed. Analysis of the power output of this equipment will be conducted as part of the CEC PIER Program.

EXPERIMENTAL

The RP-5 Renewable Energy Project throughout the conceptual design and research phase, and through the preliminary design phase, will continue to use standard research methods and equipment such as computers, phones, internet, etc. The methods and steps that have been utilized in this project include, but are not limited to the following:

- Manufacturers' survey, communications, literatures, catalogues, etc.;
- Technical workshops;
- Communications with leading experts;
- Communications with environmental control agencies;
- Manufacturers' plant visits;
- Evaluation of specific factory test results for selected equipment;
- Feed back from owners of existing installations;
- Economic evaluation;
- Life Cycle analysis; and,
- Payback calculations.

RESULTS AND DISCUSSION

The Request for Proposals for the design of the RP-5 Renewable Energy Efficiency Project was sent out. Consultant proposals have been received and are currently being evaluated. Selection of a consultant is expected by the end of July.

The central plant, which supplies cooling and heating water for the new headquarters building, has been successfully installed, tested and started.

Other innovative technologies including the flex microturbine and Stirling engine are also being sought for possible hosting and testing at IEUA's facilities. The PV system is scheduled for installation on the roof of the headquarters building by the first week of August 2003.

Although the project is falling behind schedule, IEUA is making sure that the right decisions are being made, and the best consultant is selected for this innovative project. The project progress is heading towards the implementation of the design phase in the near future.

Matching Funds

The RP-5 Renewable Energy Project and the California Energy Commission funded Commonwealth Energy Public Interest Energy Research (PIER) program to make renewable energy more affordable are closely linked and mutually beneficial. The PIER program is intended to foster the development of renewable energy demonstration projects in the Chino Basin. This program includes projects involving biogas from dairy

waste and wastewater treatment plants as well as general planning and analysis activities. Relevant PIER Program activities include the Planning and Analysis Project (Project 1.1), the Enhanced Energy Recovery at Waste Water Treatment Plants Project (Project 2.2) and the Dairy Waste to Energy Project (Project 3.1). In the current reporting period work was undertaken on several tasks in Project 1.1 directly linked to the RP –5 Renewable Energy and Energy Efficiency project. This work included tasks totaling approximately \$143,000, which serve as matching funds for the RP-5 Project. In addition, tasks under Projects 2.2 and 3.1 were initiated. Matching funds for those projects total approximately \$143,000. Therefore, overall matching fund expenditure for this period total \$286,000. Additional expenditures on Project 1.1, 2.2 and 3.1 will be presented in future quarterly reports.

Other parts of the matching funds include the time and effort that IEUA has spent so far working on the renewable energy project, and also the Contractor's time and cost for the central plant equipment and construction.

CONCLUSION

The RP-5 Renewable Energy Efficiency Project is moving ahead as planned and anticipated. The project's main highlights are summarized below:

- Original project schedule is impacted and approximately 3-6 months behind;
- Project is on budget;
- Project scope of work has been defined;
- Project RFP has been completed and sent out to participating consultants;
- Project consultant proposals were due on July 14, 2003;
- Central plant equipment has been successfully installed and started ;
- IEUA staff moved to the new headquarters on June 13, 2003;
- Flex microturbine and Stirling engines technologies are being evaluated; and
- Installation of PV power generation system at IEUA headquarters building is in progress.